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October 28, 2004
L-04-136

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Beaver Valley Power Station, Units No. 1 and No. 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Response to Generic Letter 2004-01, Requirements for Steam Generator Tube Inspections

This letter provides the FirstEnergy Nuclear Operating Company (FENOC) response for Beaver Valley Power Station (BVPS) Unit Nos. 1 and 2 to NRC Generic Letter 2004-01, "Requirements for Steam Generator Tube Inspections", dated August 30, 2004. This generic letter was issued to advise licensees of the NRC's interpretation of the technical specification (TS) requirements in conjunction with 10 CFR 50, Appendix B, with regards to steam generator tube inspection practices. This generic letter requests that licensees provide information about their steam generator inspection practices and whether these inspection practices conform to the NRC's interpretation. FENOC's response for BVPS Unit No. 1 is contained in Attachment 1. FENOC's response for BVPS Unit No. 2 is contained in Attachment 2. The regulatory commitments associated with this submittal are provided in Attachment 3.

If you have questions or require additional information, please contact Mr. Henry L. Hegrat, Supervisor - Licensing, at 330-315-6944.

I declare under penalty of perjury that the foregoing is true and correct. Executed on October 28, 2004.

Sincerely,

L. William Pearce

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Attachments
1. Beaver Valley Unit No. 1 Response to Generic Letter 2004-01
2. Beaver Valley Unit No. 2 Response to Generic Letter 2004-01
3. List of Commitments

c: Mr. T. G. Colburn, NRR Senior Project Manager
Mr. P. C. Cataldo, NRC Sr. Resident Inspector
Mr. S. J. Collins, NRC Region I Administrator

L-04-136 Attachment 1

Beaver Valley Unit No. 1 Response to Generic Letter 2004-01

Requested Information

Within 60 days of the date of this generic letter, addressees are requested to provide the following information to the NRC:

1. Addressees should provide a description of the SG tube inspections performed at their plant during the last inspection. In addition, if they are not using SG tube inspection methods whose capabilities are consistent with the NRC's position, addressees should provide an assessment of how the tube inspections performed at their plant meet the inspection requirements of the TS in conjunction with Criteria IX and XI of 10 CFR Part 50, Appendix B, and corrective action taken in accordance with Appendix B, Criterion XVI. This assessment should also address whether the tube inspection practices are capable of detecting flaws of any type that may potentially be present along the length of the tube required to be inspected and that may exceed the applicable tube repair criteria.

Beaver Valley Unit No. 1 Response:

The steam generators (SGs) at Beaver Valley Power Station (BVPS) Unit No. 1 are Westinghouse Model 51 with a U-tube configuration. The tubing material is low temperature mill annealed (LTMA) Alloy 600, 7/8" outside diameter (O.D.) with a 0.050" nominal wall thickness. The tube support plates (TSPs) are carbon steel with drilled holes. Each tube is secured in the tubesheet above the lower plenum of the SG by an explosive expansion process termed WEXTEX. The WEXTEX process expands each tube over its entire length of the tubesheet and forms the interface fit between the tube and tubesheet.

Table 1 provides a description of the SG tube inspections performed at BVPS Unit No. 1 during the inspection conducted during the fifteenth refueling outage (1R15). Prior to each inspection, a degradation assessment, which includes operating experience, was performed to identify degradation mechanisms that may be present, and a technique validation assessment was performed to verify that the eddy current techniques were capable of detecting the degradation. For each tube location where degradation may be present, Table 1 includes the type of probe used for the inspection and the inspection scope. A detailed description of the inspections, including the inspection results, is provided in BVPS Unit No. 1 twelve-month report submitted to the NRC via FENOC letter L-04-029 dated March 4, 2004 (ADAMS ML040700173).

On April 1, 1996 BVPS Unit No. 1 received NRC approval for the Generic Letter (GL) 95-05 tube support plate outside diameter stress corrosion cracking (TSPODSCC) alternate repair criteria (License Amendment No. 198). On October 15, 2004 BVPS Unit No. 1 received NRC approval of the W* inspection scope methodology for WEXTEX expansions in the tubesheet region (License Amendment No. 262). Implementation of the W* inspection scope results in the BVPS Unit No. 1 inspections being fully consistent with the NRC's position in GL 2004-01, "Requirements for Steam Generator Tube Inspections", dated August 30,2004.

2. If addressees conclude that full compliance with the TS in conjunction with Criteria IX, XI and XVI of 10 CFR Part 50, Appendix B, requires corrective actions, they should discuss their proposed corrective actions (e.g., changing inspection practices consistent with the NRC's position or submitting a TS amendment request with the associated safety basis for limiting the inspections) to achieve full compliance. If addressees choose to change their TS, the staff has included in the attachment suggested changes to the TS definitions for a tube inspection and for plugging limits to show what may be acceptable to the staff in cases where the tubes are expanded for the full depth of the tubesheet and where the extent of the inspection in the tubesheet region is limited.

BVPS Unit No. 1 Response:

No FENOC action is necessary in response to request #2 since the BVPS Unit No. 1 SG tube inspection methods are fully consistent with the NRC's position detailed in GL 2004-01.

3. For plants where SG tube inspections have not been or are not being performed consistent with the NRC's position on the requirements in the TS in conjunction with Criteria IX, XI, and XVI of 10 CFR Part 50, Appendix B, the licensee should submit a safety assessment (i.e., a justification for continued operation based on maintaining tube structural and leakage integrity) that addresses any differences between the licensee's inspection practices and those called for by the NRC's position. Safety assessments should be submitted for all areas of the tube required to be inspected by the TS where flaws have the potential to exist and inspection techniques capable of detecting these flaws are not being used, and should include the basis for not employing such inspection techniques. The assessment should include an evaluation of (1) whether the inspection practices rely on an acceptance standard (e.g., cracks located at least a minimum distance of x below the top of the tube sheet, even if these cracks cause complete severance of the tube) which is different from the TS acceptance standards (i.e., the tube plugging limits or repair criteria), and (2) whether the safety assessment constitutes a change to the "method of evaluation" (as defined in 10 CFR 50.59) for establishing the structural and leakage integrity of the joint. If the safety assessment constitutes a change to the method of evaluation under 10 CFR 50.59, the licensee should determine whether a license amendment is necessary pursuant to that regulation.

BVPS Unit No. 1 Response:

No FENOC action is necessary in response to request #3 since the BVPS Unit No. 1 SG tube inspection methods are fully consistent with the NRC's position detailed in GL 2004-01.

TABLE 1

BVPS UNIT No. 1 INSPECTION SUMMARY (1R15)

Location	Probe	Scope	Extent
Tube Support Plates	Bobbin	100%	100%
	Plus Point	Per licensed GL 95-05 ARC requirements	Per licensed GL 95-05 ARC requirements
Free Span, Sludge Pile, Non-Dented-Supports	Bobbin	100%	Full Length
Dents/Dings	Bobbin	Freespan Dings ≤ 5.0 Volts	100% Full Length Bobbin for Dings ≤ 5.0 Volts
	Plus Point	Freespan Dings ≥ 2.0 Volts but < 5.0 Volts Dented TSP's ≥ 5.0 Volts	20% of H/L TSP's & Freespan Dings ≥ 2.0 but < 5.0 Volts between TTS & 3rd H/L TSP 100% H/L TSP's
Free Span Sludge Pile Supports Tube Sheet Crevice	Plus Point	Bobbin I-Codes H/L & C/L Dents ≥ 5.0 Volts H/L & C/L	100% 100% H/L; 20% C/L (+6.0") 100% 100% H/L; 20% C/L (-8.0")
TTS Expansion Transition	Plus Point	H/L Tubesheet C/L Tubesheet	100% (+6.0"/-8.0") 20% 1 S/G Rotating Basis
Supplemental U-bend (1R15 only)	Plus Point	100% of all active U-bends	100% 7th hot leg support to 7th cold leg support
Low Row U-Bend	Plus Point	Row 1 & 2	100% 7th hot leg support to 7th cold leg support

Note: Source of information is the 1R15 Degradation, Condition Monitoring & Operational Assessments.

Beaver Valley Unit No. 2 Response to Generic Letter 2004-01

Requested Information

Within 60 days of the date of this generic letter, addressees are requested to provide the following information to the NRC:

1. Addressees should provide a description of the SG tube inspections performed at their plant during the last inspection. In addition, if they are not using SG tube inspection methods whose capabilities are consistent with the NRC's position, addressees should provide an assessment of how the tube inspections performed at their plant meet the inspection requirements of the TS in conjunction with Criteria IX and XI of 10 CFR Part 50, Appendix B, and corrective action taken in accordance with Appendix B, Criterion XVI. This assessment should also address whether the tube inspection practices are capable of detecting flaws of any type that may potentially be present along the length of the tube required to be inspected and that may exceed the applicable tube repair criteria.

Beaver Valley Unit No. 2 Response:

The steam generators (SGs) at Beaver Valley Power Station (BVPS) Unit No. 2 are Westinghouse Model 51M with a U-tube configuration. The tubing material is low temperature mill annealed (LTMA) Alloy 600, 7/8" outside diameter (O.D.) with a 0.050" nominal wall thickness. The tube support plates (TSPs) are carbon steel with drilled holes. Each tube is secured in the tubesheet above the lower plenum of the SG by a full length mechanical roll. Each mechanical roll and its transition region to the unexpanded portion of the tube at the secondary face of the tubesheet was conditioned by shot-peening prior to commercial operation to induce a compressive residual stress to mitigate the propensity for primary water stress corrosion cracking (PWSCC) in this region of the tube.

Table 2 provides a description of the SG tube inspections performed at BVPS Unit No. 2 during the last inspection conducted during the Unit No. 2 tenth refueling outage (2R10) in September 2003. Prior to each inspection, a degradation assessment, which includes operating experience, is performed to identify degradation mechanisms that may be present, and a technique validation assessment is performed to verify that the eddy current techniques are capable of detecting the degradation. For each tube location where degradation may be present, Table 2 includes the type of probe used for the inspection and the inspection scope.

A detailed description of the inspections, including the inspection results, is provided in BVPS Unit No. 2 twelve-month report submitted to the NRC via FENOC letter L-04-029 dated March 4, 2004 (ADAMS ML040700173).

The BVPS Unit No. 2 SG tube inspection methods are consistent with the NRC's position except for inspections performed within the tube sheet. BVPS Unit No. 2 applied the technical basis of topical report WCAP-16133-NP, Revision 1, "Tube-in-Tubesheet Engagement Length for the First Energy Nuclear Operating Company, Beaver Valley Power Station Unit 2 Steam Generators," to limit the rotating coil inspection extent to three inches below the top of tubesheet during the 2R10

SG inspection. WCAP-16133-NP demonstrated that the parameters detailed in WCAP-11306, Revision 2, "Tubesheet Region Plugging Criterion for the Alabama Power Company, Farley Nuclear Station, Unit 2 Steam Generators," dated April 1987, could be used to establish the required rotating coil inspection distances for the mechanical roll and roll transition regions of the tubes at BVPS Unit No. 2. WCAP-11306, Revision 2, provided the technical basis for an alternate repair criteria termed F* and was approved by the NRC for application at the Farley Unit 2 Power Plant in 1987. While the technical basis of F* was utilized to limit the rotating coil inspection extent within the tubesheet at BVPS Unit No. 2, all rotating coil detected degradation at BVPS Unit No. 2 has been repaired in accordance with the technical specification requirements. The rotating coil is capable of detecting flaws of any type that may potentially be present along the F* length. To date, service induced degradation has not been identified below the roll transition area of the tubes at BVPS Unit No. 2. The shot-peening conditioning applied prior to commercial operation at BVPS Unit No. 2 is a significant mitigative measure against PWSCC in the mechanically rolled region of the tubes and lessens the potential for degradation in this region of the tube bundle. Although unlikely to be present due to shot-peening conditioning, potential degradation that may be postulated to be present below the F* length is not inspected by rotating coils and may not be capable of being detected by the bobbin coil. Nonetheless, potential undetected degradation will not contribute to burst or leakage in accordance with the basis of WCAP-16133-NP.

The full-length bobbin coil eddy current examination fulfills the inspection requirement of the technical specifications. The inspection required by technical specifications is supplemented by specialized rotating probe eddy current examinations in regions known to be susceptible to tube degradation that is not reliably detected by bobbin coil techniques. These specialized rotating probe examinations are performed to ensure structural and leakage integrity.

2. If addressees conclude that full compliance with the TS in conjunction with Criteria IX, XI and XVI of 10 CFR Part 50, Appendix B, requires corrective actions, they should discuss their proposed corrective actions (e.g., changing inspection practices consistent with the NRC's position or submitting a TS amendment request with the associated safety basis for limiting the inspections) to achieve full compliance. If addressees choose to change their TS, the staff has included in the attachment suggested changes to the TS definitions for a tube inspection and for plugging limits to show what may be acceptable to the staff in cases where the tubes are expanded for the full depth of the tubesheet and where the extent of the inspection in the tubesheet region is limited.

BVPS Unit No. 2 Response:

As noted in response to NRC Request 1, steam generator tube inspections performed at BVPS Unit No. 2 during 2R10 are not consistent with the NRC's position in respect to inspections performed within the tube sheet. Tubesheet inspections are performed in accordance with WCAP-16133-NP, which is the technical basis for the inspection depth. The inconsistency between the NRC's position detailed in GL 2004-01 and the SG inspection practice employed in the tubesheet at BVPS Unit No. 2 has been entered into FENOC's corrective action program. To eliminate the inconsistency,

FENOC will submit a license amendment request for BVPS Unit No. 2 to modify the definition for tube inspection.

3. For plants where SG tube inspections have not been or are not being performed consistent with the NRC's position on the requirements in the TS in conjunction with Criteria IX, XI, and XVI of 10 CFR Part 50, Appendix B, the licensee should submit a safety assessment (i.e., a justification for continued operation based on maintaining tube structural and leakage integrity) that addresses any differences between the licensee's inspection practices and those called for by the NRC's position. Safety assessments should be submitted for all areas of the tube required to be inspected by the TS where flaws have the potential to exist and inspection techniques capable of detecting these flaws are not being used, and should include the basis for not employing such inspection techniques. The assessment should include an evaluation of (1) whether the inspection practices rely on an acceptance standard (e.g., cracks located at least a minimum distance of x below the top of the tube sheet, even if these cracks cause complete severance of the tube) which is different from the TS acceptance standards (i.e., the tube plugging limits or repair criteria), and (2) whether the safety assessment constitutes a change to the "method of evaluation" (as defined in 10 CFR 50.59) for establishing the structural and leakage integrity of the joint. If the safety assessment constitutes a change to the method of evaluation under 10 CFR 50.59, the licensee should determine whether a license amendment is necessary pursuant to that regulation.

BVPS Unit No. 2 Response:

A safety assessment for those portions of the tubes where the BVPS Unit No. 2 inspection scope is not consistent with the NRC position detailed in GL 2004-01 is provided below.

The extent of inspection of the BVPS Unit No. 2 SG tube mechanical roll and roll transition region is based on the Westinghouse Electric Company WCAP-16133-NP, Revision 1, entitled, "Tube-in Tubesheet Engagement Length for the First Energy Nuclear Operating Company, Beaver Valley Nuclear Station Unit 2 Steam Generators." The WCAP was developed to demonstrate the applicability of the F* methodology documented in WCAP 11306, Revision 2, to the Beaver Valley Unit No. 2 steam generators. WCAP 11306, Revision 2, documented the F* alternate repair criteria methodology and analysis that was approved by the NRC for the Farley Unit 2 steam generators. The F* analysis detailed in WCAP 11306, Revision 2, accounts for the reinforcing effect that the tubesheet has on the external surface of the SG tube within the tubesheet region. Furthermore, this F* analysis shows that tube integrity and leakage below the F* distance remain within the existing design limits. WCAP-11306, Revision 2, has been previously approved by the Nuclear Regulatory Commission for Farley Unit 2 in License Amendment 64 (Operating License No. NPF-8, Docket No. 50-364).

Based on the methodology detailed in WCAP 11306, Revision 2, and using the BVPS Unit No. 2 most stringent loads associated with plant operation, including transients and accident conditions, WCAP 16133-NP, Revision 1, defines the maximum F* length for pullout resistance as 1.94 inches below the bottom of the roll transition. This distance is increased by an allowance for Non-

Destructive Examination (NDE) uncertainties in measuring the F* length. The F* analysis detailed in WCAP 11306, Revision 2, provides the basis for tubes with any form of degradation below the F* length to remain in service. The presence of the surrounding tubesheet prevents tube rupture and provides resistance against axial pullout loads during normal and accident conditions. In addition, any primary-to-secondary leakage from tube degradation below the F* length contributes less than 5 percent of the total leakage assumed for a steamline break (SLB) accident and may be considered negligible. Consequently, any tube degradation that may go undetected in this area would not affect structural or leakage margins.

BVPS Unit No. 2 does not use WCAP-16133-NP, Revision 1, to leave degraded tubes in service via an alternate repair criteria. FENOC requires that any service induced degradation identified in the F* distance be repaired. The WCAP is only used to define the length of tubing that should be inspected with a rotating plus-point coil (RPC) probe to remove degraded tubes from service by plugging.

Operating experience has demonstrated negligible normal operating leakage from primary water stress corrosion cracking (PWSCC) even under free span conditions in roll transitions. PWSCC in roll expansions in the tubesheet region would be even further leakage limited by the tight tube-to-tubesheet crevice and the limited crack opening permitted by the tubesheet constraint. The steamline break (SLB) conditions provide the most stringent radiological hazards for postulated accidents involving loss of pressure or fluid in the secondary system. WCAP-11306, Revision 2, describes the methodology for calculating leakage for all cracks left in service and the justification to neglect the total SLB leak rate contributed by cracks below the F* distance. Nonetheless, BVPS does not allow cracks to remain in service. Therefore, RPC probe inspection in the area below the F* distance is not necessary to preclude normal operating or accident induced leakage. The use of the F* inspection scope does not involve a significant increase in the probability or consequences of an accident previously evaluated. Tube-bundle integrity will not be adversely affected by the implementation of the F* tube inspection scope. As stated previously, SG tube burst or collapse cannot occur within the confines of the tubesheet; therefore, the tube burst and collapse criteria of Regulatory Guide (RG) 1.121 are inherently met. Any degradation below the F* distance is shown by analyses and test results to be acceptable, and therefore does not result in an increase in probability of a tube rupture or an increase in the consequences of a tube rupture. Therefore, the F* inspection scope at BVPS Unit No. 2 maintains existing design limits and does not involve a significant increase in the probability or consequences of an accident previously evaluated.

The use of the F* inspection scope does not create the possibility of a new or different kind of accident from any accident previously evaluated. Again, tube burst is precluded for cracks within the tubesheet by the constraint provided by the tubesheet. However, in the unlikely event of a complete circumferential separation of a tube occurring below the F* distance, SG tube pullout is precluded, tube integrity maintained and leakage is predicted to be maintained within the Updated Final Safety Analysis Report (UFSAR) limits during all plant conditions.

Tube-bundle integrity can be assured with the F* inspection scope and can be demonstrated to be maintained during all plant conditions. Use of this scope does not induce a new mechanism that

would result in a different kind of accident from those previously analyzed. Even with the limiting circumstances of a complete circumferential separation of a tube occurring below the F* distance, SG tube pullout is precluded and leakage is predicted to be maintained within the design limits during all plant conditions. Therefore, the use of the F* inspection scope does not create the possibility of a new or different kind of accident from any previously evaluated.

The use of the F* inspection scope does not involve a significant reduction in a margin of safety. WCAP-11306, Revision 2, describes the testing that was performed to define the length of non-degraded tubing that is sufficient to compensate for the axial forces on the tube and thus prevent pullout. The operating conditions utilized in WCAP-16133-NP, Revision 1, define the BVPS Unit No. 2 operating conditions. The required F* engagement length was determined from the operating conditions defined in WCAP-16133-NP, Revision 1. Operation with potential undetected degradation below the F* distance in the roll expansion region of the SG tubing meets the margin of safety as defined by RG 1.121 and RG 1.83 and the requirements of General Design Criteria 14, 15, 16, 31, and 32. Therefore, the F* inspection scope as utilized at BVPS Unit No. 2 does not involve a significant reduction in a margin of safety.

The BVPS Unit No. 2 steam generators are considered to be in compliance with the program elements of NEI 97-06 and have been determined to be operable.

FENOC does not consider the F* methodology, or its described inspection program scope as redefining the ASME Section III pressure boundary. The selection of NDE techniques or extent of inspection does not, by itself, define the limits of the ASME pressure boundary. For example, the current technical specifications include language that excludes sections of cold leg tubing from inspection extent. The GL states that the selection of NDE techniques is not specified in the technical specifications, but is governed by the provisions of 10 CFR Part 50 Appendix B. Therefore, selection of NDE techniques is not used to define pressure boundary limits. From an integrity assessment perspective, neither past NRC approval of alternate repair criteria (ARCs) nor the suggested changes to the technical specification provided in the GL address or indicate that the basis for approval is a redefinition of the pressure boundary.

The NRC endorsed guidance for 10 CFR 50.59 evaluations (NEI 96-07) defines "method of evaluation" and the associated 10 CFR 50.59 screening protocol. Section 4.3.8 of NEI 96-07 states that methods of evaluation that are not described, outlined or summarized in the UFSAR are excluded from departure consideration. The tube integrity assessments employed by FENOC consider the entire length of pressure boundary tubing. Undetected flaws and their impact on tube integrity are addressed. The assessments are consistent with industry standards. The analyses and analysis parameters are not described, outlined or summarized in ASME Section III, ASME Section XI or in the UFSAR, and therefore would not constitute a change/departure in the method of evaluation per 10 CFR 50.59.

BVPS Unit No. 2 tube integrity assessments are performed in accordance with the provisions of the EPRI *Steam Generator Integrity Assessment Guidelines* and the structural and accident leakage integrity performance criteria specified in NEI 97-06 and NUREG 1022, "Event Reporting Guidelines 10 CFR 50.72 and 50.73", Revision 2. This ensures margins of safety consistent with the ASME Section III Code and Regulatory Guide 1.121 and that any potential accident leakage is within safety analysis limits.

TABLE 2
BVPS UNIT No. 2 INSPECTION SUMMARY

Location	Probe	Scope	Extent
Tube Support Plates	Bobbin	100%	100% all elevations
	Plus Point	Distorted Support Plates with Indications (DSIs)	100% of all DSIs
Free Span, Sludge Pile, Non-Dented-Supports	Bobbin	100%	Full Length
Dents/Dings	Bobbin	Freespan Dings ≤ 5.0 Volts	100% Full Length Bobbin for Dings ≤ 5.0 Volts
	Plus Point	Freespan Dings ≥ 2.0 Volts but < 5.0 Volts Dented TSP's ≥ 5.0 Volts	20% of H/L TSP's & Freespan Dings ≥ 2.0 but < 5.0 Volts between TTS & 3rd H/L TSP 100% H/L TSP's
Free Span Sludge Pile Supports Tube Sheet Crevice	Plus Point	Bobbin I-Codes H/L Bobbin I-Codes H/L	100% 100% H/L (+6.0") 100% 100% H/L (-3.0")
TTS Expansion Transition (includes F* distance)	Plus Point	H/L Tubesheet	100% (+6.0"/-3.0")
Supplemental U-bend (2R10 only)	Plus Point	100% Rows 3-10 20% Rows 12-18	100% 7th hot leg support to 7th cold leg support
Low Row U-Bend	Plus Point	Row 1 & 2	100% 7th hot leg support to 7th cold leg support

Note: Source of information is the 2R10 Degradation, Condition Monitoring & Operational Assessments.

List of Commitments

The following list identifies those actions committed to by FirstEnergy Nuclear Operating Company (FENOC) for Beaver Valley Power Station (BVPS) Unit Nos. 1 and 2 in this document. Any other actions discussed in the submittal represent intended or planned actions by FENOC. They are described only as information and are not regulatory commitments. Please notify Mr. Henry L. Hegrat, Supervisor - Licensing, at 330-315-6944 of any questions regarding this document or associated regulatory commitments.

COMMITMENT	DUE DATE
Submit a license amendment request for BVPS Unit No. 2 to modify the definition for tube inspection to be consistent with Generic Letter 2004-01.	March 31, 2005.